

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (original): An irrigation system for distributing water to soil, the irrigation system comprising:
a valve coupled to a source of water, the valve having an open position in which water flows through the valve;
a conduit coupled to the valve to receive the water from the valve; and
a sprinkler having an adjustable spray pattern, the sprinkler comprising a housing and a cam, the housing comprising an inlet portion coupled to the conduit to receive the water from the conduit, and an outlet portion comprising a first outlet aperture, wherein the cam is disposed adjacent to the first outlet aperture to control water flow through the first outlet aperture such that water flows beyond a group consisting of the first outlet aperture and the cam along a direction substantially parallel to a cam axis about which the cam is rotatable in-plane, wherein the cam is rotatable to a position in which the sprinkler sprays water about one or more angles totaling more than 270 degrees.

Claim 2 (original): The irrigation system of claim 1, wherein the valve is electrically controllable to move the valve between the open position and a closed position in which the valve substantially blocks water flow to the conduit.

Claim 3 (original): The irrigation system of claim 1, further comprising a plurality of additional sprinklers and conduits coupled to the valve to receive water from the valve.

Claim 4 (original): The irrigation system of claim 3, further comprising a plurality of additional valves, corresponding conduits, and corresponding sprinklers.

Claim 5 (original): The irrigation system of claim 4, further comprising at least one timer coupled to the valves to control operation of the valves.

Claim 6 (original): The irrigation system of claim 1, wherein the housing comprises a substantially cylindrical shape coaxial with the cam axis, the sprinkler further comprising a casing and a pop-up stem slidably attached to the casing, wherein the housing is attached to the pop-up stem such that the sprinkler operates as a pop-up type sprinkler.

Claim 7 (original): The irrigation system of claim 1, wherein the outlet portion comprises a substantially flat wall disposed generally perpendicular to the cam axis, wherein the first outlet aperture is formed in the substantially flat wall.

Claim 8 (original): The irrigation system of claim 1, wherein the adjustable spray pattern comprises an arc that is continuously variable through an arc angle, wherein the first outlet aperture extends through the arc angle with respect to the cam axis and has a gradually increasing radius within the arc angle, and wherein the cam comprises an outer edge having a gradually increasing radius within the arc angle.

Claim 9 (original): The irrigation system of claim 8, wherein the sprinkler further comprises a deflector positioned such that water exiting the outlet portion through the first outlet aperture is deflected to provide the spray pattern.

Claim 10 (withdrawn): The irrigation system of claim 1, wherein the outlet portion further comprises a second outlet aperture, wherein the first outlet aperture is in fluid communication with a first water distribution feature and the second outlet aperture is in fluid communication with a second water distribution feature, wherein the cam comprises an open portion alignable with either of the first and second outlet apertures to permit water to flow to either of the first and second water distribution features.

Claim 11 (original): A sprinkler having an adjustable spray pattern, the sprinkler comprising:

a housing comprising an inlet portion disposed to receive water and an outlet portion comprising a first outlet aperture; and

a cam disposed adjacent to the first outlet aperture to control water flow through the first outlet aperture such that water flows beyond a group consisting of the first outlet aperture and the cam along a direction substantially parallel to a cam axis about which the cam is rotatable in-plane; wherein the cam is rotatable to a position in which the sprinkler sprays water about one or more angles totaling more than 270 degrees.

Claim 12 (original): The sprinkler of claim 11, wherein the housing comprises a substantially cylindrical shape coaxial with the cam axis.

Claim 13 (original): The sprinkler of claim 12, further comprising a casing and a pop-up stem, wherein the housing is attached to the pop-up stem such that the sprinkler operates as a pop-up type sprinkler.

Claim 14 (original): The sprinkler of claim 11, wherein the outlet portion comprises a substantially flat wall disposed generally perpendicular to the cam axis, wherein the first outlet aperture is formed in the substantially flat wall.

Claim 15 (original): The sprinkler of claim 11, wherein the cam is disposed upstream of the first outlet aperture to adjustably impede passage of water into the first outlet aperture.

Claim 16 (original): The sprinkler of claim 11, wherein the adjustable spray pattern comprises an arc that is continuously variable through an arc angle, wherein the first outlet aperture extends through the arc angle with respect to the cam axis and has a gradually increasing radius within the arc angle.

Claim 17 (original): The sprinkler of claim 16, further comprising a deflector fixedly disposed with respect to the housing and positioned such that water exiting the outlet portion through the first outlet aperture is deflected to provide the spray pattern.

Claim 18 (withdrawn): The sprinkler of claim 16, further comprising a deflector rotatable with respect to the housing and positioned such that water exiting the outlet portion through the first outlet aperture is deflected to provide the spray pattern.

Claim 19 (original): The sprinkler of claim 16, wherein the arc includes a spray pattern in which water is sprayed substantially full-circle from the sprinkler.

Claim 20 (original): The sprinkler of claim 16, wherein the cam comprises an outer edge having a gradually increasing radius within the arc angle.

Claim 21 (withdrawn): The sprinkler of claim 11, wherein the outlet portion further comprises a second outlet aperture, wherein the first outlet aperture is in fluid communication with a first water distribution feature and the second outlet aperture is in fluid communication with a second water distribution feature, wherein the cam comprises an open portion alignable with either of the first and second outlet apertures to permit water to flow to either of the first and second water distribution features.

Claim 22 (withdrawn): The sprinkler of claim 21, wherein at least one of the first and second water distribution features is shaped to distribute water within a shape bounded by a narrow rectangle to facilitate operation of the sprinkler as a strip sprinkler.

Claim 23 (original): The sprinkler of claim 11, further comprising an adjustment dial separately formed from the cam and coupled to the cam to transmit torque manually applied to the adjustment dial by a user to the cam to induce rotation of the cam.

Claim 24 (original): A sprinkler having an adjustable spray pattern, the sprinkler comprising:

a housing comprising an inlet portion disposed to receive water and an outlet portion comprising a substantially flat wall in which a first outlet aperture is formed; and
a cam disposed adjacent to the substantially flat wall, wherein the cam is rotatable about a cam axis perpendicular to the substantially flat wall to control water flow through the first outlet aperture;
wherein the cam is rotatable to a position in which the sprinkler sprays water about one or more angles totaling more than 270 degrees.

Claim 25 (original): The sprinkler of claim 24, wherein the housing comprises a substantially cylindrical shape coaxial with the cam axis.

Claim 26 (original): The sprinkler of claim 24, wherein the adjustable spray pattern comprises an arc that is continuously variable through an arc angle, wherein the first outlet aperture extends through the arc angle with respect to the cam axis and has a gradually increasing radius within the arc angle, wherein the cam comprises an outer edge having a gradually increasing radius within the arc angle.

Claim 27 (original): The sprinkler of claim 26, wherein the arc includes a spray pattern in which water is sprayed substantially full-circle from the sprinkler.

Claim 28 (withdrawn): The sprinkler of claim 24, wherein the outlet portion further comprises a second outlet aperture formed in the substantially flat wall, wherein the first outlet aperture is in fluid communication with a first water distribution feature and the second outlet aperture is in fluid communication with a second water distribution feature, wherein the cam comprises an open portion alignable with either of the first and second outlet apertures to permit water to flow to either of the first and second water distribution features.

Claim 29 (original): The sprinkler of claim 24, wherein the cam is disposed upstream of the first outlet aperture so that the cam can block a pathway of water into a variable portion of the first outlet aperture.

Claim 30 (original): The sprinkler of claim 29, further comprising a deflector disposed downstream of the substantially flat wall to deflect water exiting the outlet away from the cam axis.

Claim 31 (withdrawn): A housing for a sprinkler having an adjustable spray pattern, the housing, comprising:

an inlet portion disposed to receive water; and
an outlet portion disposed to receive the water from the inlet portion, the outlet portion having a first outlet aperture through which the water exits the outlet portion;
wherein the first outlet aperture comprises an elongated slot extending through an arc angle with respect to a slot axis and having a gradually increasing radius within the arc angle, with respect to the slot axis.

Claim 32 (withdrawn): The housing of claim 31, wherein the housing comprises a substantially cylindrical shape coaxial with the slot axis, wherein the outlet portion comprises a substantially flat wall disposed generally perpendicular to the slot axis, wherein the first outlet aperture is formed in the substantially flat wall.

Claim 33 (withdrawn): The housing of claim 31, wherein the arc angle includes a spray pattern in which water is sprayed substantially full-circle from the sprinkler.

Claim 34 (withdrawn): The housing of claim 33, wherein the outlet portion further comprises a plurality of additional outlet apertures arranged in a spiral pattern with the first outlet aperture.

Claim 35 (original): A sprinkler having an adjustable spray pattern, the sprinkler comprising:

a housing comprising an inlet portion disposed to receive water and an outlet portion comprising a first outlet aperture disposed along a gradually increasing radius extending through an arc angle with respect to a cam axis; and
a cam disposed adjacent to the first outlet aperture, wherein the cam is rotatable in-plane about the cam axis to adjust the spray pattern of water that exits the outlet portion through the first outlet aperture.

Claim 36 (original): The sprinkler of claim 35, wherein the cam comprises an outer edge having a gradually increasing radius within the arc angle.

Claim 37 (original): The sprinkler of claim 35, wherein the arc angle includes a spray pattern in which water is sprayed substantially full-circle from the sprinkler.

Claim 38 (original): The sprinkler of claim 37, wherein the outlet portion further comprises a plurality of additional outlet apertures arranged in a spiral pattern with the first outlet aperture.

Claim 39 (original): The sprinkler of claim 35, wherein the cam is disposed upstream of the first outlet aperture to adjustably impede passage of water into the first outlet aperture.

Claim 40 (withdrawn): The sprinkler of claim 35, wherein the first outlet aperture comprises an elongated slot.

Claim 41 (original): The sprinkler of claim 35, further comprising a deflector positioned such that water exiting the outlet portion through the first outlet aperture is deflected to provide the spray pattern.

Claim 42 (original): A sprinkler having an adjustable spray pattern, the sprinkler comprising:

a housing comprising an inlet portion disposed to receive water and an outlet portion comprising a first outlet aperture;

a cam disposed adjacent to the first outlet aperture to control water flow through the first outlet aperture such that water flows beyond the group consisting of the first outlet aperture and the cam along a direction substantially parallel to a cam axis about which the cam is rotatable in-plane; and

a deflector fixedly disposed with respect to the housing and positioned such that water exiting the outlet portion through the first outlet aperture is deflected to provide the spray pattern.

Claim 43 (original): The sprinkler of claim 42, wherein the outlet portion comprises a substantially flat wall disposed generally perpendicular to the cam axis, wherein the first outlet aperture is formed in the substantially flat wall.

Claim 44 (original): The sprinkler of claim 42, wherein the adjustable spray pattern comprises an arc that is continuously variable through an arc angle, wherein the first outlet aperture extends through the arc angle with respect to the cam axis and has a gradually increasing radius within the arc angle, wherein the cam comprises an outer edge having a gradually increasing radius within the arc angle.

Claim 45 (original): The sprinkler of claim 44, wherein the arc includes a spray pattern in which water is sprayed substantially full-circle from the sprinkler.

Claim 46 (original): The sprinkler of claim 42, further comprising an adjustment dial separately formed from the cam and coupled to the cam to transmit torque manually applied to the adjustment dial by a user to the cam to induce rotation of the cam.

Claim 47 (original): The sprinkler of claim 46, wherein the deflector is disposed between the adjustment dial and the cam, the sprinkler further comprising a shaft extending through the deflector, from the adjustment dial to the cam to convey torque from the adjustment dial to the cam.

Claim 48 (original): The sprinkler of claim 47, wherein the shaft is formed separately from the adjustment dial and the cam.

Claim 49 (original): The sprinkler of claim 42, wherein the deflector has a generally conical shape.

Claim 50 (original): The sprinkler of claim 49, wherein the deflector comprises a skirt that extends along a portion of the cam axis to block water flow toward the cam axis downstream of the first outlet aperture.

Claim 51 (withdrawn): A sprinkler having an adjustable spray pattern, a housing having an axis, the housing comprising an inlet portion disposed to receive water and an outlet portion comprising a first outlet aperture; a deflector rotatable with respect to the housing and positioned such that water exiting the outlet portion through the first outlet aperture is deflected to provide the spray pattern; and a cam disposed adjacent to the first outlet aperture, wherein the cam is movable to control water flow through the first outlet aperture, thereby permitting adjustment of the spray pattern; wherein the cam is movable to a position in which the sprinkler sprays water about one or more angles totaling more than 270 degrees.

Claim 52 (withdrawn): The sprinkler of claim 51, wherein the adjustable spray pattern comprises an arc that is continuously variable through an arc angle, wherein the first outlet aperture extends through the arc angle with respect to the cam axis and has a gradually

increasing radius within the arc angle, wherein the cam comprises an outer edge having a gradually increasing radius within the arc angle.

Claim 53 (withdrawn): The sprinkler of claim 52, wherein the arc includes a spray pattern in which water is sprayed substantially full-circle from the sprinkler.

Claim 54 (withdrawn): The sprinkler of claim 51, wherein the deflector comprises a generally truncated conical shape.

Claim 55 (withdrawn): The sprinkler of claim 54, wherein the deflector comprises a plurality of vanes shaped to induce rotation of the deflector in response to impingement of water against the deflector.

Claim 56 (withdrawn): A sprinkler having an adjustable spray pattern, the sprinkler comprising:

a housing comprising an inlet portion disposed to receive water and an outlet portion comprising a first water distribution feature and a second water distribution feature configured differently from the first water distribution feature; and

a cam disposed upstream of the first and second water distribution features, the cam comprising an open portion rotatable about a cam axis to permit water to flow along a substantially straight path through the open portion to reach either of a first outlet aperture and a second outlet aperture of the outlet portion, wherein the first and second outlet apertures are in fluid communication with the first and second water distribution features, respectively.

Claim 57 (withdrawn): The sprinkler of claim 56, wherein the outlet portion comprises a substantially flat wall disposed generally perpendicular to the cam axis, wherein the first and second outlet apertures are formed in the substantially flat wall, wherein the substantially straight path is substantially parallel to the cam axis.

Claim 58 (withdrawn): The sprinkler of claim 57, wherein at least one of the first and second water distribution features is shaped to distribute water within a shape bounded by a narrow rectangle to facilitate operation of the sprinkler as a strip sprinkler.

Claim 59 (withdrawn): The sprinkler of claim 58, wherein the outlet portion further comprises a third water distribution feature, wherein the first, second, and third water distribution features permit adjustment of the spray pattern between center strip irrigation, side strip irrigation, and end strip irrigation.

Claim 60 (withdrawn): The sprinkler of claim 59, wherein the open portion comprises a notch formed in an outer edge of the cam, the cam further comprising a hole displaced from the outer edge, wherein the cam is rotatable into a position in which the first outlet aperture aligns with the notch to provide water flow to the first water distribution feature and the hole aligns

with the second outlet aperture to provide water flow to the second water distribution feature such that the first and second water distribution features cooperate to enable the sprinkler to operate as a center strip sprinkler.

Claim 61 (original): A method for distributing water to soil through the use of a sprinkler comprising a housing and a cam, the housing having an inlet portion and an outlet portion comprising a first outlet aperture, wherein the cam is disposed adjacent to the first outlet aperture, the method comprising:

receiving the water in the inlet portion of the housing;
moving the water through the first outlet aperture in a manner controlled by the cam such that water flows beyond the group consisting of the first outlet aperture and the cam along a direction substantially parallel to a cam axis about which the cam is rotatable; and
distributing the water to the soil about one or more angles totaling more than 270 degrees, along a spray pattern defined by motion of the water through the first outlet aperture.

Claim 62 (original): The method of claim 61, wherein the housing comprises a substantially cylindrical shape coaxial with the cam axis, the sprinkler further comprising a casing and a pop-up stem to which the housing is attached, the method further comprising sliding the pop-up stem upward with respect to the casing to elevate the housing upward with respect to the casing.

Claim 63 (original): The method of claim 61, wherein the first outlet aperture is formed in a substantially flat wall disposed generally perpendicular to the cam axis, wherein moving the water through the first outlet aperture comprises moving the water past the substantially flat wall.

Claim 64 (original): The method of claim 61, wherein the cam is disposed upstream of the first outlet aperture to adjustably impede passage of water into the first outlet aperture, the method further comprising moving the water through an open portion of the cam prior to passage of the water through the first outlet aperture.

Claim 65 (original): The method of claim 61, wherein the adjustable spray pattern comprises an arc that is continuously variable through an arc angle, wherein the first outlet aperture extends through the arc angle with respect to the cam axis and has a gradually increasing radius within the arc angle, wherein the cam comprises an outer edge having a gradually increasing radius within the arc angle, the method further comprising rotating the cam with respect to the first outlet aperture to determine the arc.

Claim 66 (original): The method of claim 65, wherein the sprinkler further comprises a deflector fixedly disposed with respect to the housing, the method further comprising deflecting the water downstream of the first outlet aperture to provide the spray pattern.

Claim 67 (withdrawn): The method of claim 65, wherein the sprinkler further comprises a deflector rotatable with respect to the housing, the method further comprising deflecting the water downstream of the first outlet aperture to provide the spray pattern.

Claim 68 (original): The method of claim 65, wherein distributing the water to the soil comprises spraying the water substantially full-circle from the sprinkler.

Claim 69 (withdrawn): The method of claim 61, wherein the outlet portion further comprises a second outlet aperture, wherein the first outlet aperture is in fluid communication with a first water distribution feature and the second outlet aperture is in fluid communication with a second water distribution feature, wherein the cam comprises an open portion, the method further comprising rotating the cam to align the open portion with either of the first and second outlet apertures to permit water to flow to either of the first and second water distribution features.

Claim 70 (withdrawn): The method of claim 69, wherein distributing the water to the soil comprises distributing the water within a shape bounded by a narrow rectangle to facilitate operation of the sprinkler as a strip sprinkler.

Claim 71 (original): The method of claim 61, further comprising an adjustment dial separately formed from the cam and coupled to the cam, the method further comprising manually rotating the adjustment dial to induce rotation of the cam, thereby determining the spray pattern.

Claim 72 (original): A method for manufacturing a sprinkler having an adjustable spray pattern, the method comprising:

forming a housing comprising an inlet portion disposed to receive water and an outlet portion comprising a substantially flat wall in which a first outlet aperture is formed;
forming a cam; and
disposing the cam adjacent to the substantially flat wall such that the cam is rotatable about a cam axis perpendicular to the substantially flat wall to control water flow through the first outlet aperture;
wherein the cam is rotatable to a position in which the sprinkler sprays water about one or more angles totaling more than 270 degrees.

Claim 73 (original): The method of claim 72, wherein forming the housing comprises forming a substantially cylindrical shape coaxial with the cam axis.

Claim 74 (original): The method of claim 72, wherein the adjustable spray pattern comprises an arc that is continuously variable through an arc angle, wherein forming the housing comprises forming the first outlet aperture with a gradually increasing radius within the arc angle, wherein forming the cam comprises forming an outer edge of the cam, the outer edge having a gradually increasing radius within the arc angle.

Claim 75 (original): The method of claim 74, wherein the cam is rotatable to a position in which water is sprayed substantially full-circle from the sprinkler.

Claim 76 (withdrawn): The method of claim 72, wherein forming the housing comprises forming a second outlet aperture in the substantially flat wall, forming a water distribution feature in fluid communication with the first outlet aperture, and forming a second water distribution feature in fluid communication with the second outlet aperture, wherein forming the cam comprises forming an open portion in the cam, wherein disposing the cam adjacent to the substantially flat wall comprises disposing the open portion to be alignable with either of the first and second outlet apertures to permit water to flow to either of the first and second water distribution features.

Claim 77 (original): The method of claim 72, wherein disposing the cam adjacent to the substantially flat wall comprises disposing the cam upstream of the first outlet aperture so that the cam can block a pathway of water into a variable portion of the first outlet aperture.

Claim 78 (original): The method of claim 77, further comprising:
forming a deflector; and
disposing the deflector downstream of the substantially flat wall to deflect water exiting the outlet away from the cam axis.

Claim 79 (withdrawn): A method for adjusting a spray pattern of a sprinkler, the sprinkler comprising an adjustment dial and a housing comprising an inlet portion disposed to receive water and an outlet portion comprising a first outlet aperture, the method comprising:

rotating the adjustment dial in-plane; and
altering water flow through the first outlet aperture in response to rotation of the adjustment dial to alter the spray pattern;
wherein, at one position of the adjustment dial, water is sprayed simultaneously from the sprinkler head in a substantially circular pattern.

Claim 80 (withdrawn): The method of claim 79, wherein the sprinkler further comprises a cam disposed adjacent to the first outlet aperture to control water flow through the first outlet aperture, wherein rotating the adjustment dial comprises rotating the cam with respect to the outlet aperture, about a cam axis.

Claim 81 (withdrawn): The method of claim 80, wherein the outlet portion of the housing comprises a substantially flat plate in which the first outlet aperture is formed and the cam is disposed upstream of the substantially flat plate, wherein altering water flow through the first outlet aperture comprises using the cam to block a pathway of water into a variable portion of the first outlet aperture.

Claim 82 (withdrawn): The method of claim 81, wherein the spray pattern comprises an arc that is continuously variable through an arc angle, wherein the first outlet aperture extends through the arc angle with respect to the cam axis and has a gradually increasing radius within the arc angle, wherein the cam comprises an outer edge having a gradually increasing radius within the arc angle, wherein altering water flow through the first outlet aperture comprises rotating the cam with respect to the outlet aperture to vary the arc.

Claim 83 (withdrawn): The method of claim 82, wherein the sprinkler further comprises a deflector fixedly disposed with respect to the housing, the method further comprising deflecting water exiting the outlet portion through the first outlet aperture to provide the spray pattern.

Claim 84 (withdrawn): The method of claim 82, wherein the sprinkler further comprises a deflector rotatable with respect to the housing, the method further comprising:
deflecting water exiting the outlet portion through the first outlet aperture to provide the spray pattern; and
rotating the deflector in response to contact of the water with the deflector.

Claim 85 (withdrawn): The method of claim 81, wherein the outlet portion further comprises a second outlet aperture, wherein the first outlet aperture is in fluid communication with a first water distribution feature and the second outlet aperture is in fluid communication with a second water distribution feature, wherein the cam comprises an open portion, wherein altering water flow through the first aperture comprises rotating the open portion into alignment with either of the first and second outlet apertures to permit water to flow to either of the first and second water distribution features.

Claim 86 (withdrawn): The method of claim 81, wherein the cam is formed separately from the adjustment dial, wherein rotating the adjustment dial comprises transmitting torque from the adjustment dial through a shaft to the cam to induce rotation of the cam.